TETRA TECH

June 8, 2007

Mr. Bill Joyner
Remedial Project Manager
U.S. Environmental Protection Agency, Region 4
61 Forsyth Street, SW, 11th Floor
Atlanta, Georgia 30303

Subject: **Final Site-Specific Sampling Plan**
Barite Hills Nevada Gold Fields
EPA Identification No. SCD98759703
EPA Contract No. EP-W-05-054 (START III Region 4)
Technical Direction Document (TDD) No. TTEMI-05-003-0019

Dear Mr. Joyner:

The Tetra Tech (Tetra Tech) Superfund Technical Assessment and Response Team (START) is submitting the final site-specific sampling plan (SSSP) for the expanded site inspection at the Barite Hills Nevada Gold Fields site located in McCormick, McCormick County, South Carolina. This final SSSP was prepared in accordance with verbal comments from you on June, 6, 2007. Specifically, the SSSP was revised to provide a brief description of wetlands delineation activities that will be conducted during the sampling event.

Please contact Shanna Davis at (678) 775-3109 or Sandra Harrigan at (678) 775-3088 if you have any questions regarding the SSSP.

Sincerely,

Shanna Davis
START III Site Manager

Andrew F. Johnson
START III Program Manager

Enclosure

cc: Katrina Jones, EPA Project Officer
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FINAL SITE-SPECIFIC SAMPLING PLAN
EXPANDED SITE INSPECTION

BARITE HILLS NEVADA GOLD FIELDS SITE
MCCORMICK, MCCORMICK COUNTY, SOUTH CAROLINA

EPA ID No. SCD98759703

Revision 1

Prepared for

U.S. ENVIRONMENTAL PROTECTION AGENCY
Region 4
Atlanta, Georgia 30303

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Date Prepared	:	June 8, 2007
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CONTENTS

1.0 INTRODUCTION

Under Contract No. EP-W-05-054, Technical Direction Document Number (No.) TTEMI-05-003-0019, the U.S. Environmental Protection Agency (EPA) directed the Tetra Tech (Tetra Tech) Superfund Technical Assessment and Response Team (START) to prepare a site-specific sampling plan (SSSP) for an expanded site inspection (ESI) at the Barite Hills Nevada Gold Fields (Barite Hills) site (EPA Identification No. SCD987597903). The purpose of the SSSP is to specify the type, number, and location of samples to be collected during the ESI field sampling event, as well as the sampling methodology to be followed.

All activities and procedures discussed and described in this SSSP will be conducted in accordance with the approved Tetra Tech Quality Management Plan (Reference [Ref.] 1). To further ensure that all appropriate data quality objectives (DQO) are met, Tetra Tech will perform activities in accordance with prescribed guidance documents, including the EPA Region 4 Science and Ecosystem Support Division (SESD) Environmental Investigations Standard Operating Procedures and Quality Assurance Manual (EISOPQAM) (November 2001); EPA Contract Laboratory Program (CLP) Statement of Work (SOW) for Inorganic Analysis; Standard Method 4500-CN-I for cyanide weak acid dissociation; the EPA National Functional Guidelines for Inorganic Data Review; and the EPA Data Validation Standard Operating Procedures (SOP) for CLP Routine Analytical Services, Revision 2.1. These guidance documents specifically apply to sampling locations, sample types, sampling procedures, use of data, data types, field quality assurance and quality control (QA/QC) samples, and sample analyses (Refs. 2 through 6).

The primary objective of an ESI is to determine whether a site has the potential to be placed on the National Priorities List (NPL). The NPL identifies sites at which a release, or threatened release, of hazardous substances poses a serious enough risk to public health or the environment to warrant further investigation and possible remediation under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), and the Superfund Amendments and Reauthorization Act of 1986.

Information gathered during the ESI is used to generate a preliminary Hazard Ranking System (HRS) score. The HRS score is the primary criterion EPA uses to determine whether a site should be placed on the NPL. ESIs are generally conducted at sites where additional environmental sampling or monitoring

well installation is necessary to fulfill HRS documentation requirements. ESIs also are conducted to address site issues not adequately resolved in previous investigations.

The general purposes of an ESI are to determine the presence and nature of contamination and to assess and evaluate the need for further investigation under CERCLA. ESI activities usually will include the following:

- Obtain and review relevant file material
- Collect samples to attribute hazardous substances to site operations
- Collect samples to establish background levels
- Collect samples to establish the potential for observed releases to nearby surface water bodies that receive runoff from the site
- Evaluate target populations for the surface water migration pathway
- Collect any other missing HRS data
- Prepare geographic information system (GIS) maps

The remainder of this SSSP for the Barite Hills site is organized as follows:

- Section 2.0 describes the environmental setting, presents facility background information, describes the findings of previous investigations, discusses the potential source areas, and describes site reconnaissance activities.
- Section 3.0 discusses preliminary HRS concerns for the surface water migration pathway.
- Section 4.0 summarizes proposed field sampling activities including proposed sampling locations to confirm preliminary data, fill data gaps, and determine whether further action is appropriate. This section also describes sampling methods.
- Section 5.0 describes GIS and database support.
- Section 6.0 summarizes field work activities and presents the field team and its responsibilities.
- Section 7.0 discusses the disposal of investigation derived waste (IDW).
- Appendix A provides tables and figures.
- Appendix B provides the site-specific quality assurance project plan (QAPP).

Information obtained from the South Carolina Department of Health and Environmental Control (SCDHEC) during the 2004 preliminary assessment (PA)/site inspection (SI) and technical support and sampling activities conducted by Response Engineering and Analytical Contract (REAC) personnel in March 2007 were used in the preparation of this SSSP for the Barite Hills site.

2.0 SITE BACKGROUND

This section describes the site, discusses current and past operations, summarizes previous investigations, discusses potential source areas, and summarizes site reconnaissance activities that occurred on January 16, 2007.

2.1 SITE DESCRIPTION AND ENVIRONMENTAL SETTING

The Barite Hills site is located about 3 miles southwest of the town of McCormick on the northern side of secondary Highway S-33-30 and about 0.75 mile northwest of the intersection of Highways S-33-44 and S-33-30 in McCormick County, South Carolina. Specifically, the geographic coordinates for the Barite Hills site as measured from the Rainsford Pit are latitude 33° 52' 13" (33.870396) north and longitude 82° 17' 56" (-82.29907) west (Refs. 8, page [p.] 2; 9). The surrounding area is very rural, undeveloped, and sparsely populated. No buildings, homes, or commercial facilities are located within a 0.5 mile radius of the Barite Hills site (Refs. 7, p. 2; 8, p. 1) (see Figure 1).

The Barite Hills site covers about 795.2 acres. Mining operations encompassed 135.5 acres, and the remaining 659.7 acres served as a buffer zone of areas not to be disturbed beyond their natural state (Ref. 8, p. 5). The Barite Hills site consists of two open mine pits: the 17-acre Main Pit containing about 100 million gallons of water and the 4-acre Rainsford Pit. The site also includes a process plant that contains process area ponds; a reusable heap leach facility consisting of an asphalt-lined leach pad; a permanent leach pad and permanent leach pad solution ponds; two waste disposal areas; and diversion ditches that direct runoff off site (Refs. 7, p. 26; 8, p. 3; 12, Figure 2; 16, Figure 2-1; 26) (see Figure 2).

The process area ponds and permanent leach pad solution ponds each consist of a pregnant pond (of gold-bearing solution), a barren pond (of solution stripped of gold), and a rinse pond. The process area ponds also contain a second rinse pond (Ref. 12, Figure 2).

2.2 FACILITY BACKGROUND INFORMATION

The Barite Hills site was previously owned by Nevada Gold Fields Inc. who operated the site as a mine. Mining operations at the site began in January 1991. The site actively mined gold and silver until 1992 and actively mined gold from 1992 until 1995 (Refs. 7, p. 2; 8, p. 1; 13, pp. 6, 7, 8; 14, p. 3). The gold ore was mined from the two on-site pits, crushed, agglomerated, and placed on a leach pad. A cyanide

solution was then pumped to the leach pad from the barren pond and allowed to percolate through the heaps. The resulting pregnant leach solution flowed by gravity to the bottom of each leach pad segment and into a transport ditch. The transport ditch transferred the solution to the pregnant pond, where the pregnant solution was pumped to the process plant for gold recovery (Refs. 7, p. 6; 10 Section F, pp. 10 and 12; 14, Figure 2.2).

Gold recovery at the process plant began with the adsorption of the gold in the pregnant solution onto activated carbon. The loaded carbon was stripped using an electrowinning process. Electro-deposited gold was then melted into doré bars that were shipped off site for additional refining (Ref. 7, p. 6).

The barren solution was pumped to the barren pond, where cyanide was added and the pH was adjusted. The barren solution was either recycled back into the leaching circuit or treated using calcium hyperchlorite followed by secondary treatment to reduce cyanide and copper concentrations before being discharged to an unnamed tributary. After the completion of an expanded wastewater treatment facility in 1994, waste solutions were primarily treated using hydrogen peroxide instead of calcium hyperchlorite (Refs. 7, p. 6; 12, Figure 2; 13, p. 7).

Waste by-products from mining operations included waste rock (overburden material) excavated from the mine to expose the ore and leached agglomerates from the leach pad produced after an economically efficient amount of gold was leached and the agglomerates were rinsed (Ref. 10, Section F, pp. 10 and 12). Waste rock that did not undergo cyanide leaching was disposed of in the Rainsford and Main Pits. Ore that underwent cyanide leaching and rinsing was subsequently disposed of into two on-site solid waste areas, Waste Disposal Areas A and C (Ref. 8, p. 3). Barite Hills planned to dispose of the rock waste and leached agglomerates in three disposal areas; however, according to available file information, waste rock and leached agglomerates were disposed of in Waste Disposal Areas A and C only (Refs. 10, Section F, pp. 16, 36, and 37; 12, p. 1-1, Figure 2; 14, p. 2-1; 18, pp. 35, 77, 78). In 1992, Barite Hills obtained a permit to change Waste Disposal Area C to a permanent leach pad facility. In addition, construction of the Waste Disposal Area C landfill also began in 1992 (Refs. 12, pp. 1-1 and 1-4; 14, p. 78). This landfill was permitted as an industrial solid waste landfill to store partially rinsed spent ore from the reusable leach pad that could not meet leachate water quality standards (Ref. 12, p. 1-2).

In 1995, site reclamation activities at the Barite Hills site began. Reclamation activities are conducted to rehabilitate affected land for useful purposes and to protect natural resources and the surrounding area within reason (Ref. 27, p. 3). Areas that have been reclaimed include the permanent leach pad, the Waste

Disposal Area C landfill, the Rainsford Pit, Waste Disposal Area A, and the former crusher/reusable leach pad area (mineralized zone). Reclamation activities ceased in 1997, and areas remaining to be reclaimed include the Main Pit, permanent leach pad solution ponds, and process area solution ponds (Refs. 11, p. 1; 13, p. 7). Before reclamation activities ceased, lime was added to the water in the Main Pit to raise the pH of its water to 11 standard units (Ref. 15, p. 2).

In June 1999, Nevada Gold Fields Inc. filed for Chapter 11 bankruptcy, and in July of the same year, the keys to the Barite Hills site were given to SCDHEC and the site was abandoned (Refs. 7, p. 1; 13, p. 8; 15, p. 1).

2.3 PREVIOUS INVESTIGATIONS

In July 2003, SCDHEC's Bureau of Land and Waste Management, Site Assessment Section, visited the Barite Hills site. A heavy sulfur odor was noted on entrance through the main gate, about 0.25 mile from the Main Pit, and continuing over the Main Pit area. The Main Pit was partially filled, and high-sulfide rock with an estimated 30 to 40 percent sulfide was present at the surface of the pit in the fill above the water surface. Treatment ponds were at capacity, and liners were present. Further investigation of the Barite Hills site was recommended to prevent acid generation and runoff (Ref. 28, pp. 1 and 2).

In November 2003, SCDHEC conducted another site visit. Water in the Main Pit had a pH of 2 to 2.2 standard units. SCDHEC stated that because of the sulfide waste rock in the Main Pit, the water quality of the Main Pit was adversely affecting ground water and surface waters in the site area (Ref. 7, p. 6).

In 2004, SCDHEC conducted a PA/SI at the Barite Hills site. PA/SI activities included the collection of 12 source samples (eight surface water and four sediment samples) from the on-site process area ponds, permanent leach pad solution ponds, and the Main Pit. CERCLA hazardous substances detected in the source samples include arsenic, barium, cadmium, chromium, copper, lead, zinc, mercury, and cyanide. SCDHEC also collected 11 sediment samples and six surface water samples from unnamed tributaries of Hawe Creek. Constituents detected at elevated concentrations in the sediment samples collected from the unnamed tributaries include arsenic, barium, cadmium, copper, lead, and zinc. A constituent concentration is considered elevated if it exceeds or is equal to three times the concentration of the constituent detected in a background or control sample. When a constituent is undetected in a background or control sample, any concentration equal to or exceeding the sample quantitation limit is considered elevated. The sediment samples also contained arsenic (three samples), cadmium (two

samples), copper (eight samples), lead (seven samples), and zinc (one sample) at concentrations exceeding their respective EPA Region 4 SESD Waste Management Division sediment screening values (SSV) for hazardous waste sites (Refs. 7, pp. 22, 23, and 24; 16, p. 14). Constituents detected at elevated concentrations in surface water samples collected from unnamed tributaries of Hawe Creek include barium, copper, and lead. In addition, these surface water samples detected copper (three samples) and lead (four samples) at concentrations exceeding their respective EPA Region 4 SESD Waste Management Division freshwater surface water chronic screening values for hazardous waste sites (Refs. 7, p. 25; 16, p. 6).

In March 2007, EPA directed REAC to provide removal site evaluation activities at the Barite Hills site. Activities included collecting sediment samples along unnamed tributaries of Hawe Creek and Hawe Creek, which receive runoff from the site, as well as collecting physical characterization and water quality data. Analytical results of sediment samples indicated the presence of arsenic, barium, cadmium, chromium, copper, and mercury at elevated concentrations. The focus of the REAC investigation was to determine if the walls of the Main Pit could withstand a catastrophic event such as a hurricane and/or tornado. The focus of the study was not to fill HRS data gaps; therefore, surface water samples were not collected during the sampling event.

2.4 SITE RECONNAISSANCE

In January 2007, Tetra Tech, EPA, REAC, and SCDHEC personnel conducted a site reconnaissance at the Barite Hills site. Reconnaissance activities included a site walk in which Tetra Tech observed the Main Pit, process ponds, wetland areas, former site structures, and drainage pathways. During the site walk, a seep from the northern side of the Main Pit was observed to be flowing into an unnamed tributary of Hawe Creek.

2.5 AREAS OF CONCERN

Based on historical file material, information obtained from SCDHEC personnel, and the on-site reconnaissance, Tetra Tech identified four areas of concern within the boundaries of the site property, which are as follows:

- 17-acre Main Pit containing about 100 million gallons of water with a pH of 2 or less
- Process area ponds, which include a pregnant pond (1,729,100 gallons), a barren pond (722,300 gallons), and two rinse ponds (711,600 and 155,300 gallons, respectively)

- Permanent leach pad solution ponds, which include a pregnant pond (1,580,000 gallons), barren pond (6,864,000 gallons), and rinse pond (1,080,000 gallons)

Figure 2 depicts the location of each area of concern.

3.0 SURFACE WATER PRELIMINARY HAZARD RANKING SYSTEM CONCERNS

Overland flow at the Barite Hills site is directed down the slopes and out of the site's drainage area through defined drainage courses in the topography and on-site diversion ditches (Refs. 12, p. 2-6; 14, p. 78). The most significant surface water drainage ways at the site are two unnamed perennial tributaries of Hawe Creek. The first tributary flows along the northern side of the site for about 4,000 feet. The second tributary begins on the southern side of the site and flows west and then north along the western side of the site for about 1 mile and joins the tributary north of the site. The confluence of the two tributaries is located about 1,584 feet northwest of the Barite Hills site boundary (Refs. 7, p. 18; 19, p. 45) (see Figure 4). From the confluence, the unnamed tributary flows about 800 feet into Hawe Creek. Hawe Creek flows about 4.8 miles before entering Strom Thurmond Lake on the Savannah River (see Figure 4). Flow continues in the Savannah River for the remainder of the 15-mile surface water migration pathway target distance limit (TDL) (Ref. 7, p. 18).

In May 1994, the Barite Hills site acquired a National Pollution Discharge Elimination System (NPDES) permit to discharge storm water runoff from the site to three outfalls that flow into the two unnamed tributaries of Hawe Creek. The on-site drainage courses and non-maintained diversion ditches direct surface water runoff to the three NPDES outfall locations. According to the site's NPDES permit, NPDES Outfall 001 is located directly west of Waste Disposal Area A, NPDES Outfall 002 is located directly south of the permanent leach pad barren pond, and NPDES Outfall 003 is located north of the Main Pit (Ref. 18, pp. 5 and 6). However, according to file information, at an unspecified time, the Barite Hills site changed the location of NPDES Outfall 003 to NPDES Outfall 002; NPDES Outfall 003 was discontinued; and an additional outfall location, NPDES Outfall 01A, was added. NPDES Outfall 01A is located south of the Rinse Pond 1 (Refs. 11, Figure 2; 24, pp. 4 and 5) (see Figure 4). All NPDES outfall locations flow into unnamed tributaries of Hawe Creek.

SCDHEC issued several notices of violation (NOV) between December 1995 and December 1997 for exceedances of the site's NPDES permit limitations. Violations at Outfall 001 include exceedances of ammonia nitrogen, cadmium, copper, cyanide, pH, selenium, zinc, total residuals, and total suspended

solids. One NOV was issued for an exceedance of aluminum at Outfall 01A. Violations at Outfall 003 include exceedances of barium, cadmium, copper, cyanide, lead, oil and grease, pH, selenium, total suspended solids, and zinc (Ref. 24, pp. 4 and 5).

During the PA/SI and the 2007 site reconnaissance, a seep from the northern side of the Main Pit was observed to be flowing into an unnamed tributary of Hawe Creek. SCDHEC personnel stated that during previous site visits, there was a visible difference in water color downstream of this seep location. Macroinvertebrate surveys have been conducted at the Barite Hills site on a bi-annual basis since 1992 as a NPDES permit requirement (Ref. 24, p. 3). The March 1995 macroinvertebrate study indicated little or no impact to the northern tributary of Hawe Creek or to Hawe Creek from mining operations at the Barite Hills site; however, discharge from NPDES Outfall 001 has significantly impacted the western unnamed tributary downstream to its confluence with Hawe Creek, essentially eliminating the fish and macroinvertebrates from this portion of the tributary (Ref. 17, p. 11). A macroinvertebrate study conducted in July 1996 attributed the reduction in macroinvertebrate diversity near NPDES Outfall 001 to beaver activity, which decreased flow in the tributary and destroyed the macroinvertebrate habitat (Ref. 24, p. 3). File information does not indicate subsequent macroinvertebrate studies occurring after 1996.

No surface water intakes are located within the 15-mile TDL downstream of the Barite Hills site (Refs. 7, p. 21; 20). Fishing occurs where Hawe Creek enters Strom Thurmond Lake about 2.2 miles downstream of the Barite Hills site (Ref. 21) (see Figure 4). During the 2004 PA/SI, an SCDHEC wetlands delineation specialist established the presence of wetlands near NPDES Outfall 001 along the western unnamed perennial tributary of Hawe Creek (Refs. 22; 23; 25). These wetlands are depicted on the National Wetlands Inventory map as palustrine forested wetlands. In addition, about 2 miles of HRS-eligible wetland frontage are located along the surface water migration pathway leading up to Strom Thurmond Lake (Ref. 25).

4.0 PROPOSED SAMPLING PLAN

The purpose of the ESI is to verify the preliminary HRS score by collecting additional samples to strengthen the surface water migration pathway. Tetra Tech will focus on collecting samples to attribute release to the Barite Hills site, fill existing data gaps, and to delineate the wetland area located southwest of NPDES Outfall 01. Figures 3 and 4 show proposed sampling locations. Tables 1, 2, and 3 outline the numbers and types of samples proposed and the rationale for each sampling location. Surface soil

samples are proposed in this SSSP in the event that distinct areas of runoff are observed during the ESI sampling activities.

All samples will be submitted to EPA CLP laboratories for analysis for all inorganic constituents listed on the EPA Target Analyte List as well as weak acid dissociable cyanide in accordance with the EPA CLP SOW for Multi-Media, Multi-Concentration, Inorganic Analysis, ILM05.4, December 2006 (Ref. 3). Also, the laboratories will prepare the samples for weak acid dissociable cyanide in accordance with the Standard Method 4500-CN-I, and analyze the samples for cyanide based on the CLP SOW for inorganic analysis (Ref. 6).

Table 4 summarizes the QA/QC samples to be collected during field sampling activities. Table 5 presents the analytical methodology for each sample matrix, as well as the appropriate sample container and sample preservative. Sampling and field QA/QC procedures for ESI field activities will be conducted in accordance with the EPA SESD Region 4 EISOPQAM (Ref. 2). Laboratory QA/QC procedures will be conducted in accordance with the EPA SESD Region 4 EISOPQAM; EPA National Functional Guidelines for Inorganic Data Review; and the EPA Data Validation SOP for CLP Routine Analytical Services, Version 2.1 (Refs. 2; 4; 5). The site-specific QAPP is provided in Appendix B. Sections 4.1 and 4.2 provide data review, verification, and validation details for samples to be collected during the investigation.

4.1 SURFACE WATER SAMPLING

To document on-site contaminants, Tetra Tech will collect six surface water samples from on-site ponds. Surface water samples will be collected from the process area ponds and the permanent leach pad solution ponds. Both sets of ponds contain a rinse pond, barren pond, and pregnant pond. Tetra Tech will collect one surface water sample from each of the six ponds.

To document a release of hazardous substances to surface water, Tetra Tech will collect nine surface water samples from Hawe Creek and unnamed tributaries of Hawe Creek. Specifically, seven surface water samples will be collected from unnamed tributaries of Hawe Creek that receive runoff from the site and two surface water samples will be collected from Hawe Creek. In addition, one surface water sample will be collected directly downgradient of Outfall No. 1 and four surface water samples will be collected along the wetland area located west of Outfall No. 1. To attribute potential contaminants detected in on-site samples, Tetra Tech will collect three background surface water samples as follows: 1) upgradient of

the Barite Hills site from an unnamed tributary (Tributary 2), which is located directly north of the site; 2) at the unnamed tributary south of site and upstream of its confluence with Tributary 3; and 3) along the headwaters of Hawe Creek northwest of the Barite Hills site.

Table 1 provides details concerning surface water sampling locations. Surface water samples will be collected from the surface of the water by partially submerging the sampling container into the water. On-site surface water sampling locations are depicted on Figure 3, and off-site surface water sampling locations are depicted on Figure 4. Surface water sampling activities will be conducted in accordance with the EPA SESD Region 4 EISOPQAM, Section 10 (Ref. 2).

4.2 SEDIMENT SAMPLING

Tetra Tech will collect six sediment samples from on-site ponds to determine on-site contaminants. Tetra Tech will also collect 17 sediment samples from Hawe Creek and unnamed tributaries of Hawe Creek to determine whether hazardous substances are migrating from the Barite Hills site. Sediment samples will be collected at the same locations as the surface water samples discussed in Section 4.1. Table 2 provides details concerning sediment samples to be collected. On-site sediment sampling locations are depicted on Figure 3, and off-site sediment sampling locations are depicted on Figure 4.

Sediment samples will be collected at a depth of 0 to 3 inches below land surface using pre-cleaned stainless-steel hand augers or spoons and pre-cleaned stainless-steel bowls. Sediment sampling activities will be conducted in accordance with the EPA Region 4 SESD EISOPQAM, Section 11(Ref. 2). Stainless-steel spoons and bowls will be dedicated to each sampling location.

4.3 SURFACE SOIL SAMPLING

Tetra Tech will collect surface soil samples in the event that distinct areas of runoff are observed during sampling activities. The exact number of surface soil samples to be collected is not known; however, the number will not exceed three samples. The exact location of the surface soil samples will be determined in the field. To attribute potential contaminants detected in on-site samples, Tetra Tech will collect one background surface soil sample (in addition to the maximum three samples discussed above) from an undisturbed location of the site, the exact location will be determined in the field. The surface soil samples will be collected from 0 to 6 inches below ground surface. Tetra Tech will visually survey the background sampling locations to ensure that the areas exhibit minimal impact from the site; therefore,

background sampling locations may be moved based on the visual survey. Table 3 provides details concerning surface soil samples to be collected. Surface soil samples will be collected using pre-cleaned stainless-steel hand augers or spoons and pre-cleaned stainless-steel bowls. Surface soil sampling activities will be conducted in accordance with the EPA Region 4 SESD EISOPQAM, Section 12 (Ref. 2).

5.0 GEOGRAPHIC INFORMATION SYSTEM AND DATABASE SUPPORT

During field activities, the geographic coordinates for all sampling locations will be determined using a Trimble® global positioning system unit with submeter accuracy. To better document specific sampling locations, before field work begins, Tetra Tech will load geographic coordinates of the study area boundary into the Trimble® unit to ensure that the field sampling team conducts field activities within a specified area. All data collected in the field will be downloaded from the Trimble® unit, reviewed for accuracy at the end of each field day, and then uploaded into the site database. This electronic process will minimize the degree of potential errors associated with manual data input. Geographic coordinates also will be used to prepare GIS maps and figures for the Barite Hills site. Specifically, Tetra Tech will prepare a large map depicting sampling locations and results compared to relevant comparison values such as background levels, EPA Region 9 preliminary remediation goals, and HRS Level I criteria for all investigations to date.

Tetra Tech will create a site database using SCRIBE format. Once the validated analytical data packages become available, Tetra Tech will upload the data into the project database using the electronic data delivery (EDD) files received from SESD. This process will ensure that the data are properly uploaded into the site database and will minimize the number of errors in the database. Tetra Tech will implement a QA/QC process for database management support by conducting a random QA/QC comparison between the data contained in the database, the EDDs, and hard copy analytical data packages. The database will be used to generate analytical data summary tables for the ESI report and subsequent deliverables requested by the EPA Task Monitor.

6.0 FIELD WORK SUMMARY

Tetra Tech will conduct sampling activities at the Barite Hills site during the week of June 11, 2007. Proposed sampling locations are described in Section 4.0 and shown on Figures 3 and 4. The Tetra Tech field team leader and the EPA Remedial Project Manager may change sampling locations and the number

of samples to be collected in response to site conditions at the time of the sampling visit. ESI activities will be conducted, and QA/QC samples will be collected, in accordance with procedures documented in the EPA Region 4 SESD 4 EISOPQAM, the EPA National Functional Guidelines for Inorganic Data Review, and the EPA Data Validation SOP for CLP Routine Analytical Services, Version 2 (Refs. 2; 4; 5). All CLP samples will be analyzed in accordance with the EPA CLP SOW for Inorganic Analysis (ILM05.4 [inductively coupled plasma-atomic emission spectrometry]) (Ref. 3). Samples for weak acid dissociable cyanide will be prepared in accordance with Standard Method 4500-CN-I (Ref. 6). The Tetra Tech health and safety protocol proposed to be followed during the sampling event is described in the site-specific health and safety plan (HASP), which will be available during sampling activities.

Field team members and their responsibilities are as follows:

- Shanna Davis — Field Team Leader
- Dale Von Busch — GIS Specialist
- Kyle Russell — Wetland Delineation Specialist
- David Reyna — Sampling Team Member
- Quinn Kelley — Sampling Team Member

A Tetra Tech wetland delineation specialist will delineate wetland areas in accordance with the Army Corps of Engineers Wetlands Delineation Manual, January 1987. Documentation of wetland delineation activities and findings are essential for the preparation of an HRS documentation record. All findings will be documented in logbook notes, field sheets, and a wetlands delineation report.

All specific training requirements for personnel will be addressed in the site-specific HASP. EPA will be responsible for obtaining access to the Barite Hills site. Tetra Tech will provide a list of sampling locations to EPA. EPA reserves the right to conduct oversight of sampling activities.

7.0 DISPOSAL OF INVESTIGATION-DERIVED WASTE

IDW will generally consist of disposable latex gloves, boot covers, plastic bags, and Tyvek. These items are used mainly for sample collection, to prevent cross-contamination, and to provide personnel protection and sanitary conditions during sampling activities. If contact with concentrated wastes occurs, disposable gear and sampling supplies will be secured on site in a 55-gallon drum until sample analytical results are received. If analytical data reveal contamination at levels that require special handling, these

wastes will be disposed of by a licensed transport and disposal firm. Tetra Tech will make every effort to profile drum contents, procure a transport and disposal firm, and remove the drums from the Barite Hills site before demobilizing from the site; however, if necessary, up to 3 months will be allowed to complete the drum profile and procurement of a transport and disposal firm.

If in the best professional judgment of the field team leader, IDW can be rendered nonhazardous, the IDW will be double-bagged and deposited in an industrial waste container as directed in the IDW Management Guidance Manual. IDW determined to be nonhazardous will be disposed of in accordance with applicable regulations and EISOPQAM guidance (Refs. 2; 29).

REFERENCES

1. Tetra Tech EM Inc. (Tetra Tech), Quality Management Plan, July 2006.

2. U.S. Environmental Protection Agency (EPA), Region 4, Science and Ecosystem Support Division (SESD), Environmental Investigations Standard Operating Procedures and Quality Assurance Manual (EISOPQAM), November 2001.

3. EPA, Statement of Work (SOW) for Multi-Media, Multi-Concentration Inorganic Analysis (ILM05.4), December 2006.

4. EPA Contract Laboratory Program (CLP) Functional Guidelines for Inorganic Data Review, EPA540-R-04/004, October 2004.

5. EPA, Data Validation Standard Operating Procedures for CLP Routine Analytical Services, Revision 2.1, July 1999.

6. American Public Health Association, American Water Works Association, Water Environment Federation. Standard Method for Examination of Water and Wastewater. 20th Edition.

7. South Carolina Department of Health and Environmental Control (SCDHEC). PA/SI Report for Barite Hills/Nevada Goldfields (Barite Hills). Prepared by the Site Assessment Section, Bureau of Land and Waste Management. December 2006.

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22. Tetra Tech. Project Note to File Regarding E-mail Message from Tim Kadar, SCDHEC. Shanna Davis, Environmental Scientist. January 30, 2007.

23. SCDHEC. Field Logbook for Barite Hills/Nevada Goldfields Wetland Delineation. Site Assessment Section, Bureau of Land and Waste Management, Christopher Bartley and Benjamin Bair. October 19, 2006.

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and John Wright, Ground Water Quality Section, Bureau of Water. To Jonathan McInnis, Site Assessment Section, Bureau of Land and Waste Management. July 2003.

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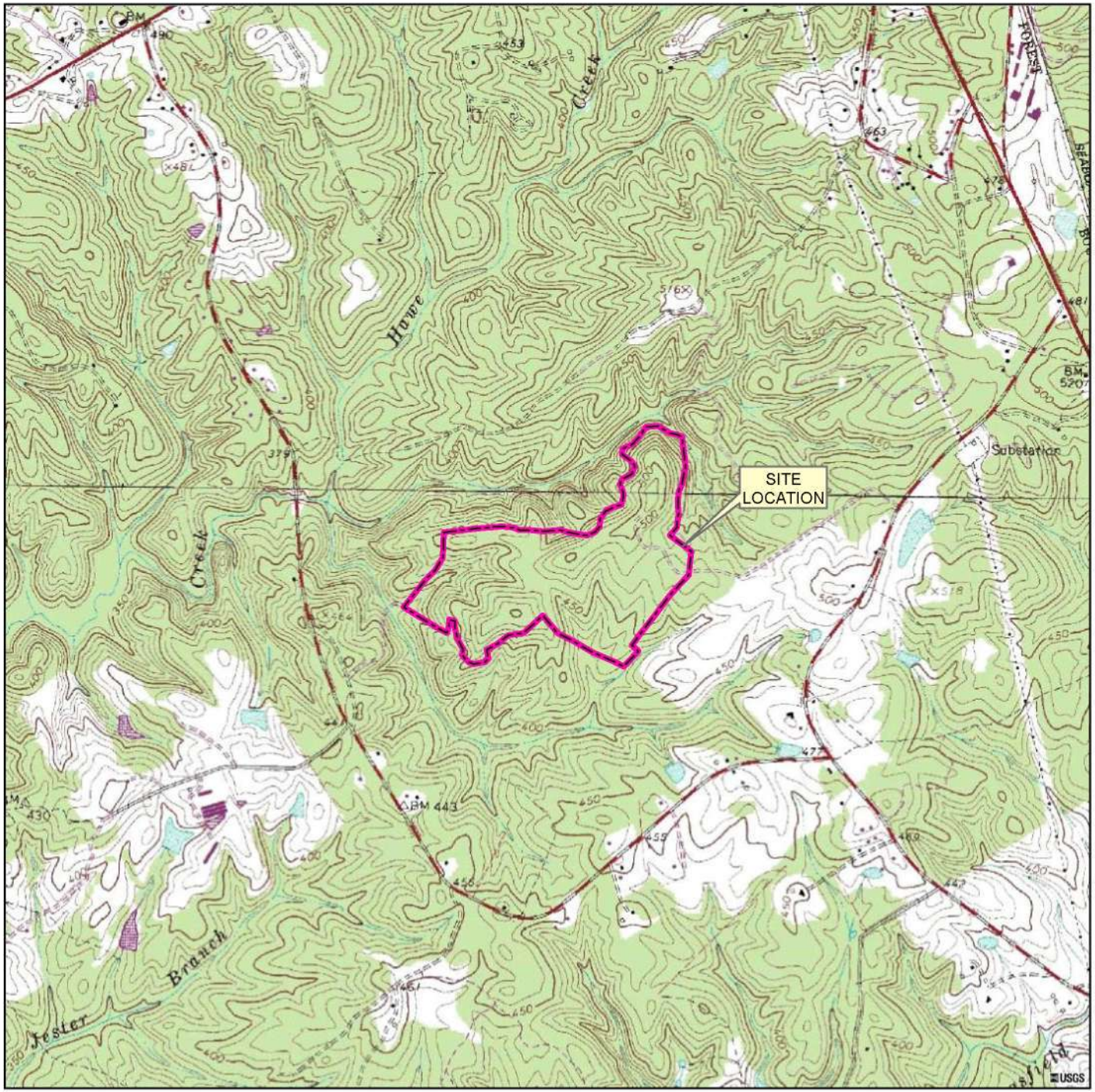
APPENDIX A

TABLES AND FIGURES

(11 Pages)

FIGURES

TABLES



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1:24,000

MAP SOURCE:
USGS, MCCORMICK, SC
& PLUM BRANCH, SC-GA
TOPOGRAPHIC QUADRANGLES, 1987

United States Environmental Protection Agency

BARITE HILLS NEVADA GOLD FIELDS
MCCORMICK,
MCCORMICK COUNTY,
SOUTH CAROLINA
TDD No. TTEMI-05-003-0019

FIGURE 1
SITE LOCATION

TETRA TECH

2007-5-31 \\GIS_Workspace\TTEMI-05-003-0019_Barite_Hills_Nevada_Gold_Fields\GIS\MXD\FIG-1 SITE LOC MAP 5-31-07.mxd TTEMI\KY dale.vonbusch

OUTFALL 3

Main Pit

Rinse Pond 2

Barren Pond

Pregnant Pond

OUTFALL 01A

Rinse Pond 1

Reusable Asphalt Leach Pad

ACCESS/HAUL ROAD

Waste Disposal Area A

Waste Disposal Area C Landfill

OUTFALL 1

Permanent Leach Pad

Rainsford Pit

Pregnant Pond

Rinse Pond

Barren Pond

OUTFALL 2

Note: Site Features digitized from Steffen, Robertson, and Kirsten (U.S.), Inc. 1995

2005 Aerial Image Provided By Globe Explorer

LEGEND

- OUTFALLS
- SITE BOUNDARY
- SITE FEATURES

0 200 400 Feet

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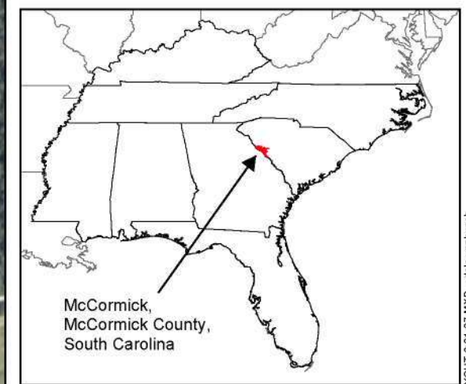


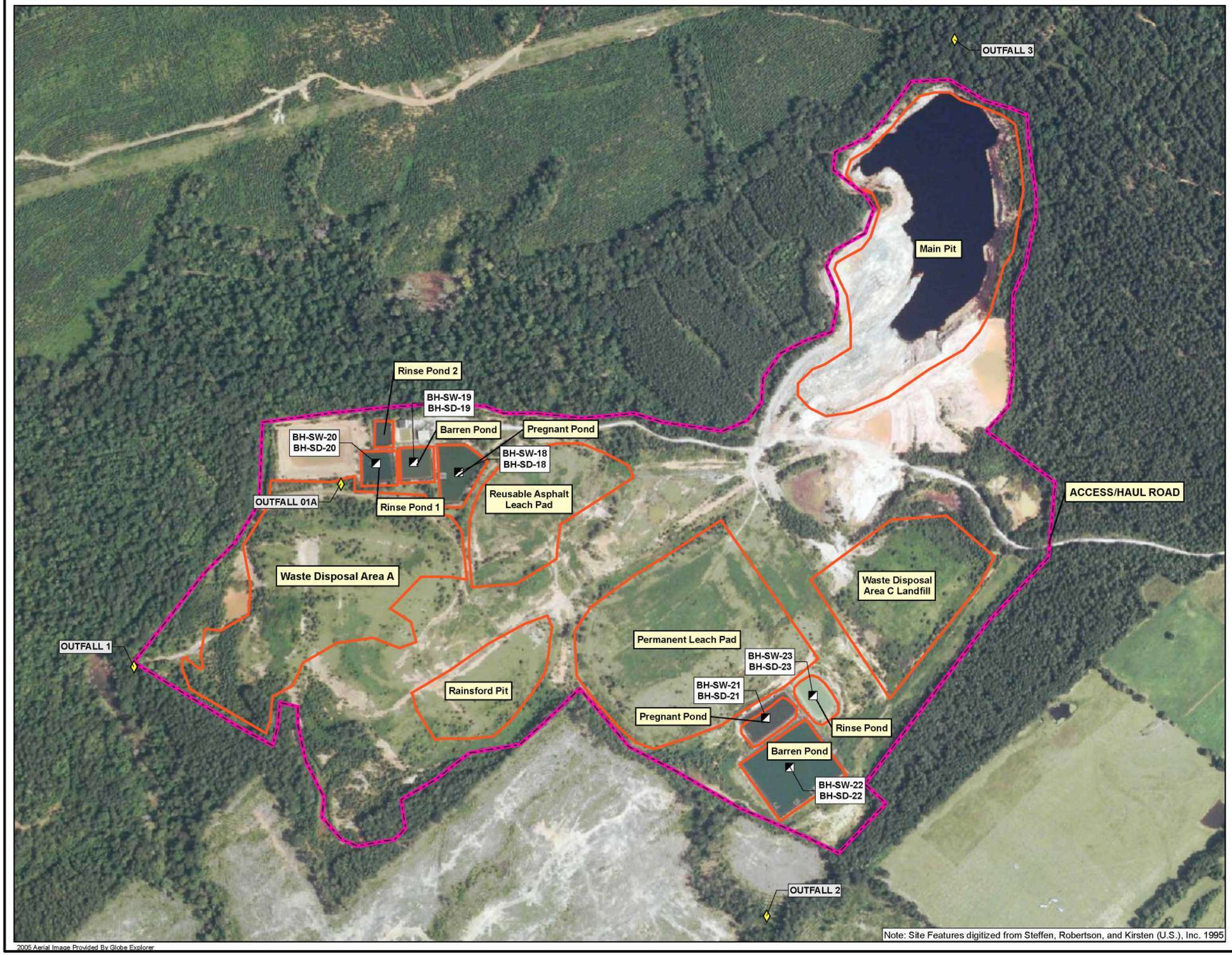
United States Environmental Protection Agency

BARITE HILLS NEVADA GOLD FIELDS
MCCORMICK,
MCCORMICK COUNTY,
SOUTH CAROLINA
TDD No. TTEMI-05-003-0019

FIGURE 2
SITE LAYOUT

TETRA TECH

2007-06-01 \GIS\Workspace\TTEMI-05-003-0019_Barite_Hills_Nevada_Gold_Fields\GIS\MXD\FIG-2_SITE LAYOUT 6-01-07.MXD dale.vonbesch

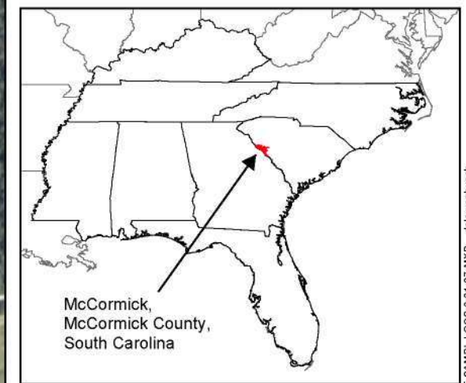


LEGEND

- OUTFALLS
- SURFACE WATER SAMPLE LOCATION (BH-SW-XX)
  SEDIMENT SAMPLE LOCATION (BH-SD-XX)
- SITE BOUNDARY
- SITE FEATURES

0 200 400 Feet

1:4,800



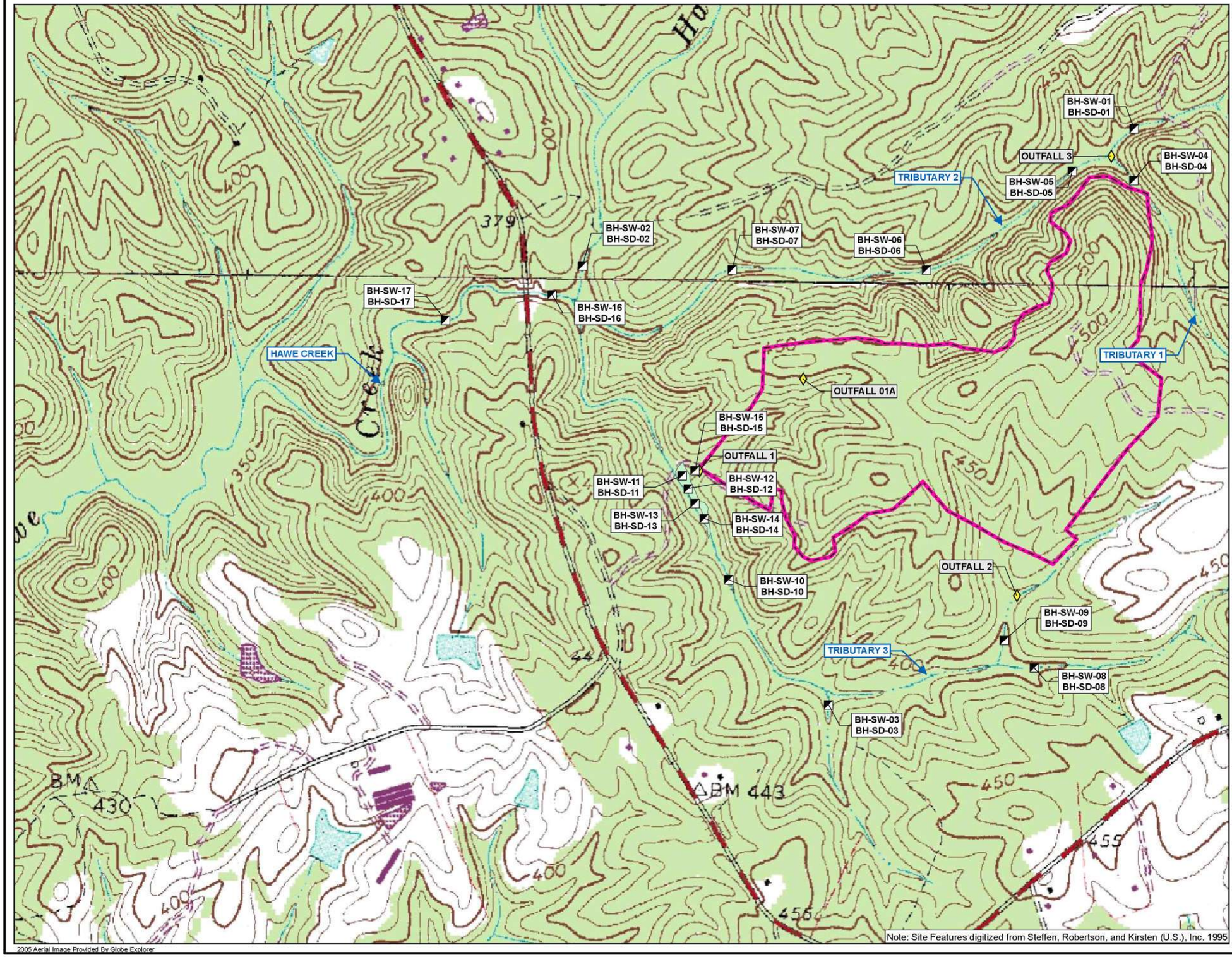
United States Environmental Protection Agency

BARITE HILLS NEVADA GOLD FIELDS
MCCORMICK,
MCCORMICK COUNTY,
SOUTH CAROLINA
TDD No. TTEMI-05-003-0019

FIGURE 3
ON-SITE
SAMPLING LOCATIONS

TETRA TECH

2007-06-01 IGIS_Workspace\TTEMI-05-003-0019_Barite_Hills_Nevada_Gold_Fields\GIS\MXD\FIG-3 ON-SITE SAMPL LOCS 6-01-07.MXD dale.vonbusch



LEGEND

- OUTFALLS
- SURFACE WATER SAMPLE LOCATION (BH-SW-XX)
- SEDIMENT SAMPLE LOCATION (BH-SD-XX)
- SITE BOUNDARY

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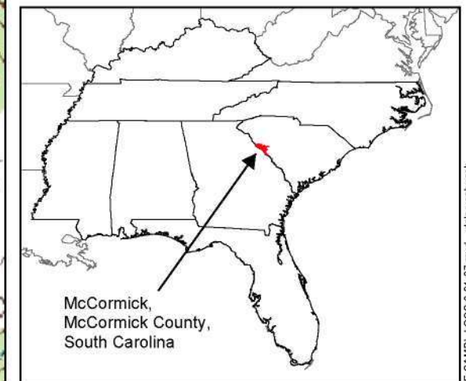

United States
Environmental Protection Agency

BARITE HILLS NEVADA GOLD FIELDS
MCCORMICK,
MCCORMICK COUNTY,
SOUTH CAROLINA
TDD No. TTEMI-05-003-0019

FIGURE 4
OFF-SITE
SAMPLING LOCATIONS

TETRA TECH

2007-06-01 - IGIS_Workspace\TTEMI-05-003-0019_Barite_Hills_Nevada_Gold_Fields\GIS\MXD\sFIG-4_OFF-SITE_SAMPL_LOCS-6-01-07.mxd - dale.vonbusch

TABLE 1
BARITE HILLS
SURFACE WATER SAMPLING PLAN

Sample Number	Grab or Composite	Location	Rationale
BH-SW-01	Grab	Tributary 2, north and upgradient of site	Background surface water sample for comparison to downgradient ground water sample results
BH-SW-02	Grab	Hawe Creek, northwest and upgradient of site	Background surface water sample for comparison to downgradient ground water sample results
BH-SW-03	Grab	Unnamed tributary south of site and upstream of its confluence with Tributary 3	Background surface water sample for comparison to downgradient ground water sample results
BH-SW-04	Grab	Tributary 1, east of site	Determine presence or absence of hazardous substances
BH-SW-05	Grab	Tributary 2, north of site	Determine presence or absence of hazardous substances
BH-SW-06	Grab	Tributary 2, north of site	Determine presence or absence of hazardous substances
BH-SW-07	Grab	Tributary 2, north of site	Determine presence or absence of hazardous substances
BH-SW-08	Grab	Tributary 3, south of site	Background surface water sample for comparison to downgradient ground water sample results
BH-SW-09	Grab	Unnamed tributary south of site, downstream of Outfall No. 2	Determine presence or absence of hazardous substances
BH-SW-10	Grab	Tributary 3, west of site	Determine presence or absence of hazardous substances
BH-SW-11	Grab	Tributary 3, wetland area	Determine presence or absence of hazardous substances
BH-SW-12	Grab	Tributary 3, wetland area	Determine presence or absence of hazardous substances
BH-SW-13	Grab	Tributary 3, wetland area	Determine presence or absence of hazardous substances
BH-SW-14	Grab	Tributary 3, wetland area	Determine presence or absence of hazardous substances
BH-SW-15	Grab	Directly downgradient of Outfall No. 1 before entering Tributary 3	Determine presence or absence of hazardous substances
BH-SW-16	Grab	Hawe Creek, northwest of site	Determine presence or absence of hazardous substances
BH-SW-17	Grab	Hawe Creek, northwest of site	Determine presence or absence of hazardous substances
BH-SW-18	Grab	On-site, process area ponds, pregnant pond	Determine presence or absence of hazardous substances
BH-SW-19	Grab	On-site, process area ponds, barren pond	Determine presence or absence of hazardous substances

TABLE 1 (Continued)
BARITE HILLS
SURFACE WATER SAMPLING PLAN

Sample Number	Grab or Composite	Location	Rationale
BH-SW-20	Grab	On-site, process area ponds, rinse pond 1	Determine presence or absence of hazardous substances
BH-SW-21	Grab	On-site, permanent leach pad solution ponds, pregnant pond	Determine presence or absence of hazardous substances
BH-SW-22	Grab	On-site, permanent leach pad solution ponds, barren pond	Determine presence or absence of hazardous substances
BH-SW-23	Grab	On-site, permanent leach pad solution ponds, rinse pond	Determine presence or absence of hazardous substances

Notes:

BH = Barite Hills
SW = Surface water

TABLE 2
BARITE HILLS
SEDIMENT SAMPLING PLAN

Sample Number	Grab or Composite	Depth	Location	Rationale
BH-SD-01	Grab	0 to 3 inches	Tributary 2, north and upgradient of site	Background sediment sample for comparison to downgradient ground water sample results
BH-SD-02	Grab	0 to 3 inches	Hawe Creek, northwest and upgradient of site	Background sediment sample for comparison to downgradient ground water sample results
BH-SD-03	Grab	0 to 3 inches	Unnamed tributary south of site and upstream of its confluence with Tributary 3	Background sediment sample for comparison to downgradient ground water sample results
BH-SD-04	Grab	0 to 3 inches	Tributary 1, east of site	Determine presence or absence of hazardous substances
BH-SD-05	Grab	0 to 3 inches	Tributary 2, north of site	Determine presence or absence of hazardous substances
BH-SD-06	Grab	0 to 3 inches	Tributary 2, north of site	Determine presence or absence of hazardous substances
BH-SD-07	Grab	0 to 3 inches	Tributary 2, north of site	Determine presence or absence of hazardous substances
BH-SD-08	Grab	0 to 3 inches	Tributary 3, south of site	Background sediment sample for comparison to downgradient ground water sample results
BH-SD-09	Grab	0 to 3 inches	Unnamed tributary south of site, downstream of Outfall No. 2	Determine presence or absence of hazardous substances
BH-SD-10	Grab	0 to 3 inches	Tributary 3, west of site	Determine presence or absence of hazardous substances
BH-SD-11	Grab	0 to 3 inches	Tributary 3, wetland area	Determine presence or absence of hazardous substances
BH-SD-12	Grab	0 to 3 inches	Tributary 3, wetland area	Determine presence or absence of hazardous substances
BH-SD-13	Grab	0 to 3 inches	Tributary 3, wetland area	Determine presence or absence of hazardous substances
BH-SD-14	Grab	0 to 3 inches	Tributary 3, wetland area	Determine presence or absence of hazardous substances
BH-SD-15	Grab	0 to 3 inches	Directly downgradient of Outfall No. 1 before entering Tributary 3	Determine presence or absence of hazardous substances
BH-SD-16	Grab	0 to 3 inches	Hawe Creek, northwest of site	Determine presence or absence of hazardous substances

TABLE 2 (Continued)
BARITE HILLS
SEDIMENT SAMPLING PLAN

Sample Number	Grab or Composite	Depth	Location	Rationale
BH-SD-17	Grab	0 to 3 inches	Hawe Creek, northwest of site	Determine presence or absence of hazardous substances
BH-SD-18	Grab	0 to 3 inches	On-site, process area ponds, pregnant pond	Determine presence or absence of hazardous substances
BH-SD-19	Grab	0 to 3 inches	On-site, process area ponds, barren pond	Determine presence or absence of hazardous substances
BH-SD-20	Grab	0 to 3 inches	On-site, process area ponds, rinse pond 1	Determine presence or absence of hazardous substances
BH-SD-21	Grab	0 to 3 inches	On-site, permanent leach pad solution ponds, pregnant pond	Determine presence or absence of hazardous substances
BH-SD-22	Grab	0 to 3 inches	On-site, permanent leach pad solution ponds, barren pond	Determine presence or absence of hazardous substances
BH-SD-23	Grab	0 to 3 inches	On-site, permanent leach pad solution ponds, rinse pond	Determine presence or absence of hazardous substances

Notes:
BH = Barite Hills
SD = Sediment

TABLE 3
BARITE HILLS
SURFACE SOIL SAMPLING PLAN

Sample Number	Grab or Composite	Depth	Location	Rationale
BH-SS-01	Grab	0 to 6 inches	To be determined	Background surface soil sample for comparison to downgradient surface soil sample results
BH-SS-02	Grab	0 to 6 inches	To be determined	Determine presence or absence of hazardous substances
BH-SS-03	Grab	0 to 6 inches	To be determined	Determine presence or absence of hazardous substances
BH-SS-04	Grab	0 to 6 inches	To be determined	Determine presence or absence of hazardous substances

Notes:
BH = Barite Hills
SS = Surface soil

TABLE 4
BARITE HILLS
QUALITY ASSURANCE/QUALITY CONTROL SAMPLING PLAN

Sample Number	Sample Type	Rationale
BH-RB-01	Equipment rinsate blank	Determine if decontamination procedures adequately clean equipment.
BH-PB-01	Preservative blank	Determine if preservatives or sample handling procedures are influencing analytical results.
BB-XX-XX	Metals blank	Determine if unknown site conditions or sample handling procedures are influencing analytical results.
BH-XX-XX	MS/MSD (Provided by SESD)	Provide information about the effect of each sample matrix on the sample preparation procedures and measurement methodology.
BH-XX-XX	Field duplicates	Measure both field and laboratory precision.

Notes:

BB	=	Blind metals blank provided by the U.S. Environmental Protection Agency Science and Ecosystem Support Division Analytical Branch
BH	=	Barite Hills
MS/MSD	=	Matrix spike/matrix spike duplicate
PB	=	Preservative blank
RB	=	Rinsate blank
SESD	=	U.S. Environmental Protection Agency Science and Ecosystem Support Division

TABLE 5
BARITE HILLS
ANALYTICAL METHODOLOGY

Analytical Parameter	Parameter: to be noted on chain-of-custody records	Matrix	Analytical Method (from CLP SOW)	Number[3] and Type of Sample Container	Preservation Method	Sample Holding Time
SEDIMENT SAMPLES						
Target Analyte List[1] (TAL) Metals, Mercury, and Cyanide (CN)	TAL metals	Sediment	ILM05.4	One 8-ounce glass jar with Teflon®-lined lid	Cool to 4 °C	28 days for mercury and 6 months for all other metals
CLPSOW CN WAD	Cyanide	Sediment	ILM05.4	One 8-ounce glass jar with Teflon®-lined lid	Cool to 4 °C	6 months
AQUEOUS[3] SAMPLES						
TAL[1] Metals and Mercury	TAL metals	Aqueous[2]	ILM05.4 (ICP-AES)	One 1-liter polyethylene bottle	Nitric acid (HNO_3) to pH<2; cool to 4 °C	28 days for mercury and 6 months for all other metals
Cyanide, Total	Cyanide	Aqueous[2]	ILM05.4 (ICP-AES)	One 1-liter polyethylene bottle	Sodium hydroxide (NaOH) to pH≥12; cool to 4 °C	14 days
CLPSOW CN WAD	WAD Cyanide	Aqueous[2]	ILM05.4 (ICP-AES)	One 1-liter polyethylene bottle	Sodium hydroxide (NaOH) to pH≥12; cool to 4 °C	14 days

Notes:

[1] = CLP SOW ILM05.4, which can be viewed at the following website: http://www.epa.gov/superfund/programs/clp/ilm5.htm.

[2] = Aqueous samples may include surface water samples, field blanks, and equipment rinsate blanks.

[3] = For aqueous samples designated for matrix spike and matrix spike duplicate (MS/MSD) analysis, triple volumes of sample will need to be collected. For soil and sediment samples designated for MS/MSD analysis, no additional sample volume is needed for TAL metals and cyanide.

°C = Degrees Celsius
< = Less than
≥ = Greater than or equal to
AES = Atomic emission spectrometry
CLP = Environmental Protection Agency Contract Laboratory Program
ICP = Inductively coupled plasma
ILM = Multi-media, multi-concentration inorganic analysis ILM 05.4.
SOW = Statement of work
WAD = Weak acid dissociation. Samples for WAD CN will be prepared using Standard Method 4500 CN-1 and analyzed using CLP SOW ILM 05.4.

APPENDIX B

SITE-SPECIFIC QUALITY ASSURANCE PROJECT PLAN

(5 Pages)

QUALITY ASSURANCE PROJECT PLAN SHORT FORM
U.S. ENVIRONMENTAL PROTECTION AGENCY, REGION 4 & TETRA TECH INC.
SUPERFUND TECHNICAL ASSESSMENT AND RESPONSE TEAM CONTRACT NO. EP-W-05-054

PROJECT INFORMATION

Site Name: Barite Hills Nevada Gold Fields			**City, County:** McCormick, McCormick	**State:** South Carolina
EPA Task Monitor: Bill Joyner			**Tetra Tech Inc. Project Manager:** Sandra Harrigan	
Approved By:	Sandra Harrigan		**Prepared For:** U.S. Environmental Protection Agency, Region 4	
Title:	Tetra Tech Project Manager	**Date:**		
Approved By:	John Schendel, Ph.D.			
Title:	Tetra Tech Quality Assurance Manager	**Date:**		
Approved By:	Andy Johnson		**Prepared By:** Tetra Tech **Name:** Shanna Davis, Site Manager **Date:** June 4, 2007	
Title:	Tetra Tech START III Program Manager	**Date:**		
Approved By:	Bill Joyner			
Title:	EPA Task Monitor	**Date:**		

1.0 PROJECT MANAGEMENT

1.1 Distribution List:

EPA Region 4:

Bill Joyner, EPA Remedial Project Manager and Task Monitor
Katrina Jones, EPA Project Officer
Darryl Walker, EPA Alternate Project Officer

Tetra Tech EM Inc.:

Andy Johnson, Tetra Tech Program Manager
John Schendel, Tetra Tech Quality Assurance Manager
Sandra Harrigan, Tetra Tech Project Manager
Angel Reed, Tetra Tech Document Control Coordinator

1.2 Project/Task Organization

Bill Joyner of the U.S. Environmental Protection Agency (EPA) Region 4 will serve as the EPA Task Monitor for the activities described in this QAPP. Sandra Harrigan of Tetra Tech will serve as the Tetra Tech Project Manager and is responsible for maintaining an approved version of this QAPP. John Schendel of Tetra Tech will serve as the Tetra Tech Quality Assurance (QA) Manager and is responsible for providing Tetra Tech approval of this QAPP. The EPA Region 4 Science and Ecosystem Support Division (SESD) Analytical Services Branch in Athens, Georgia will conduct data validation and oversee the EPA Contract Laboratory Program (CLP) services and CLP non-routine analytical services (non-RAS) provided for this project.

1.3 Problem Definition/Background:

☐ Description attached.

■ Description in referenced report: Site-Specific Sampling Plan (**Title**) June 4, 2007 (**Date**)

1.4 Project/Task Description:

☐ Description attached.

■ Description in referenced report: Site-Specific Sampling Plan (**Title**) June 4, 2007 (**Date**)

Schedule: A date for the field work has not been scheduled. Field work is expected to last for two weeks.

1.5 Quality Objectives and Criteria for Measurement Data:

a. Accuracy:	■ Identified in Tables 1 and 2.
b. Precision:	■ Identified in Tables 1 and 2.
c. Representativeness:	■ Identified in Tables 1 and 2.
d. Completeness*:	■ Identified in Tables 1 and 2.
e. Comparability:	■ Identified in Tables 1 and 2.

Other Description:
*A completeness goal of 95 percent has been established for this project. However, if the completeness goal is not met, EPA may still be able to make site decisions based on any or all of the remaining validated data.

1.6 Special Training/Certification Requirements:

■ OSHA 29 CFR 1910.120 ■ Special Equipment/Instrument Operator (describe below): ☐ Other (describe below):

Special Requirements: Capable of operating a global positioning system (GPS) instrument; YSI water quality meter; and Forms II Lite. Also proficient with conducting soil and sediment sampling using hand augers.

1.7 Documentation and Records:

The most current version of this QAPP will be distributed to the entire distribution list presented in Section 1.1 above. The Tetra Tech project manager will be responsible for maintaining the most current revision of this QAPP, for distributing it to all personnel and parties involved in the field effort. Field records that will be generated include the following:

☐ Field Sheets ■ Site Logbook ■ Photographic log ■ Site Maps and Drawings
■ Chains-of-Custody Forms ■ Health and Safety Plan ☐ Field instrument calibration logs ☐ Field monitoring and screening results

Field documentation and records will be generated and maintained in accordance with the requirements presented in the following EPA Region 4 SESD guidance document: *Environmental Investigations Standard Operating Procedures and Quality Assurance Manual (EISOPQAM)*, November 2001. This document can be found at the following web address: http://www.epa.gov/region4/sesd/eisopqam/eisopqam.html.

CLP laboratory analytical data will be generated and maintained in accordance with the appropriate CLP statements of work for inorganic analysis. EPA Region 4 SESD will oversee the CLP and CLP non-RAS laboratories, maintain the CLP and CLP non-RAS laboratory analytical data, and conduct all data validation in accordance with EPA policy and applicable federal regulations.

The formal deliverables for EPA associated with this project are specified in the EPA Technical Direction Document and the planning meeting summary dated May 25, 2007. An expanded site inspection report will be prepared to present the results of the CLP and CLP non-RAS laboratory analytical results and a wetland delineation report will be prepared to summarize Tetra Tech's findings on the nearby wetland.

All project records under Tetra Tech's control will be maintained and retained in accordance with the requirements of EPA START III Contract No. EP-W-05-054.

2.0 DATA GENERATION AND ACQUISITION

2.1 Sampling Process Design:

The Site-Specific Sampling Plan, dated June 4, 2007, presents details on the types and numbers of samples to be collected, sample locations, sample matrices, CLP and CLP non-RAS laboratory analytical methods, and rationale for the proposed sampling locaitons. GPS units will be used to document sampling locations and the perimeter of the wetland area. Grab sampling will be conducted. Samples submitted to a fixed laboratory for analysis will be analyzed for EPA Target Analyte List (TAL) metals (inorganic constituents). These analytical parameters will be analyzed by one or more CLP and CLP non-RAS laboratories.

2.2 Sample Methods Requirements:

Matrix	Sampling Method	EPA Standard Operating Procedures and Guidance
Surface water	Refer to Site-Specific Sampling Plan, June 4, 2007	Refer to the EPA Region 4, SESD EISOPQAM, November 2001, which is located at the following web address: http://www.epa.gov/region4/sesd/eisopqam/eisopqam.html.
Sediment	Refer to Site-Specific Sampling Plan, June 4, 2007	Refer to the EPA Region 4, SESD EISOPQAM, November 2001, which is located at the following web address: http://www.epa.gov/region4/sesd/eisopqam/eisopqam.html.

QUALITY ASSURANCE PROJECT PLAN SHORT FORM
U.S. ENVIRONMENTAL PROTECTION AGENCY, REGION 4 & TETRA TECH INC.
SUPERFUND TECHNICAL ASSESSMENT AND RESPONSE TEAM CONTRACT NO. EP-W-05-054

Other Sample Method Requirements: The Tetra Tech field team leader, in cooperation with the EPA Task Monitor, will be responsible for: identifying failures in sampling and field measurement systems, overseeing any corrective actions, ensuring that the corrective actions are documented in site logbooks and other appropriate records, and assessing the effectiveness of corrective actions. Field decontamination will be conducted in accordance with the procedures provided in the EPA Region 4, SESD EISOPQAM, November 2001, which is located at the following web address: http://www.epa.gov/region4/sesd/eisopqam/eisopqam.html. Field sample preparation guidance, including analytical parameters, numbers and types of sample containers, preservation methods, and holding times, is presented in the Site-Specific Sampling Plan, dated June 4, 2007.

2.3 Sample Handling and Custody Requirements:

CLP and CLP non-RAS sample handling and chain-of-custody record keeping will be conducted in accordance with EPA Region 4 requirements for processing and submitting samples to CLP and CLP non-RAS laboratories. The EPA Forms II Lite software will be used to process the samples and generate the chain-of-custody records. Additional guidance can be found in *Contract Laboratory Program Guidance For Field Samplers*, EPA Office of Superfund Remediation and Technology Innovation, Final, August 2004; this document can be found at the following web address: http://www.epa.gov/superfund/programs/clp/download/sampler/samp0804.pdf. Sample handling, custody, and shipping procedures are also presented in the EPA Region 4, SESD EISOPQAM, November 2001, which is located at the following web address: http://www.epa.gov/region4/sesd/eisopqam/eisopqam.html.

2.4 Analytical Methods Requirements:

Field monitoring guidance is provided in the EPA Region 4, SESD EISOPQAM, November 2001, which is located at the following web address: http://www.epa.gov/region4/sesd/eisopqam/eisopqam.html. The operator's manual for each particular field instrument also will present information on its use. In addition, the following Tetra Tech standard operating procedures (SOP) should be followed: SOP No. 005-1 for soil sampling, SOP No. 006-3 for sludge/sediment sampling, and SOP No. 009-3 for surface water sampling.

The CLP and CLP non-RAS analytical parameters and associated CLP and CLP non-RAS fixed laboratory analytical methods that will be used for this project are presented in the Site-Specific Sampling Plan, dated June 4, 2007.

2.5 Quality Control Requirements:

Quality control requirements for field monitoring are provided in the EPA Region 4, SESD EISOPQAM, November 2001, which is located at the following web address: http://www.epa.gov/region4/sesd/eisopqam/eisopqam.html.

Quality control requirements for CLP analytical methods are presented in the associated CLP statement of work for inorganic analysis.

Field quality control samples will include one equipment rinsate blank per week of sampling activities, per lot of organic free or ultra pure blank water used in the field for decontamination; matrix spike and matrix spike duplicate (MS/MSD) sample sets collected at a frequency of one MS/MSD set per matrix and per 20 environmental samples collected for each matrix; and field duplicate samples collected at a frequency of one field duplicate sample per matrix and per 20 environmental samples collected for each matrix. All quality control samples will be submitted for the analyses of CLP and CLP non-RAS parameters listed in the attached Tables 1 and 2.

2.6 Instrument/Equipment Testing, Inspection, and Maintenance Requirements:

For instrument testing, inspection, and maintenance requirements for field monitoring, refer to the EPA Region 4, SESD EISOPQAM, November 2001, which is located at the following web address: http://www.epa.gov/region4/sesd/eisopqam/eisopqam.html. Also refer to the manufacturer's operating manual for further instructions on instrument testing, inspection, and maintenance.

Instrument testing, inspection, and maintenance requirements for CLP and CLP non-RAS analytical methods are presented in the statement of work for inorganic analysis, as well as in associated manufacturer's operating manuals.

2.7 Instrument Calibration and Frequency:

For instrument calibration and frequency requirements for field monitoring, refer to the EPA Region 4, SESD EISOPQAM, November 2001, which is located at the following web address: http://www.epa.gov/region4/sesd/eisopqam/eisopqam.html. Also refer to the manufacturer's operating manual for further instructions on calibration.

Instrument calibration and frequency requirements for CLP and CLP non-RAS analytical methods are presented in the statement of work for inorganic analysis, as well as in associated manufacturer's operating manuals.

2.8 Inspection/Acceptance Requirements for Supplies and Consumables:

All sample containers will meet EPA criteria for cleaning procedures for low-level chemical analysis. Sample containers will have certifications (to be attached to the field logbook as permanent field records) provided by the manufacturer in accordance with pre-cleaning criteria established by the EPA.

Inspection and acceptance requirements for supplies and consumables for CLP and CLP non-RAS analytical methods are presented in the statement of work for inorganic analysis.

2.9 Non-Direct Measurements Requirements:

Previous data and other information pertaining to the site (including other analytical data, reports, photos, maps, and so forth) may have been compiled from file information obtained from EPA, its contractor(s), state and local government agencies, and property owners. Some of that data and information is presented in the Site-Specific Sampling Plan, dated June 4, 2007. The extent to which this data and information, if any, is used to achieve the objectives of this project will be determined by Tetra Tech in cooperation with the EPA Task Monitor. Any justifications and qualifications required for the use of this data and information will be provided in the reports generated for this project.

2.10 Data Management:

All field-generated data will be managed as part of the permanent field record for the project. All CLP and CLP non-RAS laboratory analytical data will be managed in accordance with the requirements of the statement of work for inorganic analysis, and according to EPA Region 4 policy and applicable Federal regulations. Finally, all field-generated data and other records generated or obtained during this project will be managed according to the requirements of the EPA START III Contract No. EP-W-05-054.

3.0 ASSESSMENT AND OVERSIGHT

3.1 Assessment and Response Actions:

Field and laboratory audits will not be conducted for this project. CLP and CLP non-RAS laboratory data will be validated by the EPA Region 4 SESD. All deliverables that Tetra Tech contributes to in whole or in part will be subjected to the corporate three-tiered review process, including a technical review, an editorial review, and a quality control review.

3.1A Corrective Action:

Refer to Section 2.2 of this QAPP (under the heading "**Other Sample Method Requirements**") for corrective action guidance for field activities.

Corrective action requirements for CLP and CLP non-RAS analytical methods are presented in the statement of work for inorganic analysis.

3.2 Reports to Management:

Data validation reports for the CLP and CLP non-RAS laboratory data generated during this project will be maintained by the EPA Region 4 SESD. All formal deliverables to EPA associated with this project (as specified in the EPA Technical Direction Document, including the Site-Specific Sampling Plan and the Expanded Site Inspection report will be managed and distributed in accordance with the requirements of the EPA START III Contract No. EP-W-05-054.

4.0 DATA VALIDATION AND USABILITY

4.1 Data Review, Verification, and Validation Requirements:

All field-generated data and records will be reviewed for completeness and accuracy by the Tetra Tech project manager and appropriate designees. CLP and CLP non-RAS laboratory analytical data will be reviewed and validated by the EPA Region 4 SESD.

4.2 Verification and Validation Methods:

All field-generated data will be maintained in the project file and included (as appropriate) in project deliverables in final form following all reviews and associated corrective actions. The EPA Region 4 SESD will provide CLP and CLP non-RAS laboratory analytical results with all data validation qualifiers applied; additional data validation results can be obtained upon request by the EPA Task Monitor.

4.3 Reconciliation with User Requirements:

The Tetra Tech project manager, in cooperation with the EPA Task Monitor, will be responsible for reconciling the data and other project results with the requirements specified in this QAPP and by the data users and decision makers. Depending on the nature of how specific data quality indicators do not meet the project's requirements, the data may be discarded and re-sampling and reanalysis of the subject samples may be required. Re-sampling, reanalysis, or other out-of-scope actions identified to address data quality deficiencies and data gaps will require approval by the EPA Task Monitor, EPA Project Officer, and EPA Contracting Officer.

QUALITY ASSURANCE PROJECT PLAN SHORT FORM
U.S. ENVIRONMENTAL PROTECTION AGENCY, REGION 4 & TETRA TECH INC.
SUPERFUND TECHNICAL ASSESSMENT AND RESPONSE TEAM CONTRACT NO. EP-W-05-054

TABLE 1: SAMPLE SUMMARY

Site Name: Barite Hills Nevada Gold Fields				**City, County, State:** McCormick, McCormick County, South Carolina			
No. of Samples	**Matrix**	**Location**	**Purpose**	**Depth or other Descriptor**	**Requested Analysis**	**Sampling Method**	**Analytical Method**
ALL MATRICES							
Refer to the Site-Specific Sampling Plan, dated June 4, 2007							
QUALITY CONTROL SAMPLES							
Refer to the Site-Specific Sampling Plan, dated June 4, 2007 and to Section 2.5 of this QAPP.							

TABLE 2: DATA QUALITY OBJECTIVE SUMMARY

Site Name: Barite Hills/Nevada Goldfields				**City, County, State:** McCormick, McCormick County, South Carolina		
Analysis	**Analytical Method**	**Data Quality Measurements**				
		Accuracy	**Precision**	**Representativeness**	**Completeness**	**Comparability**
ALL MATRICES						
TAL metals, mercury, cyanide, and cyanide weak acid dissociation	Refer to the Site-Specific Sampling Plan, dated June 4, 2007	Refer to EPA Region 4, SESD EISOPQAM, November 2001; and the CLP and CLP non-RAS analytical methods	Refer to EPA Region 4, SESD EISOPQAM, November 2001; and the CLP and CLP non-RAS analytical methods	Sampling will be based on professional judgement with the intention of determining the presence or absence of hazardous substances at the site relative to background concentrations and other criteria. Samples will be collected in areas suspected of contamination	95 percent	Standardized, EPA-approved procedures for sample collection and sample analysis will be used for all field and laboratory work.